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Strategic Intelligence Monitor on Personal Health Systems Phase 3 (SIMPHS3)

Renewing Health Carinthia (Austria)

Case Study Report

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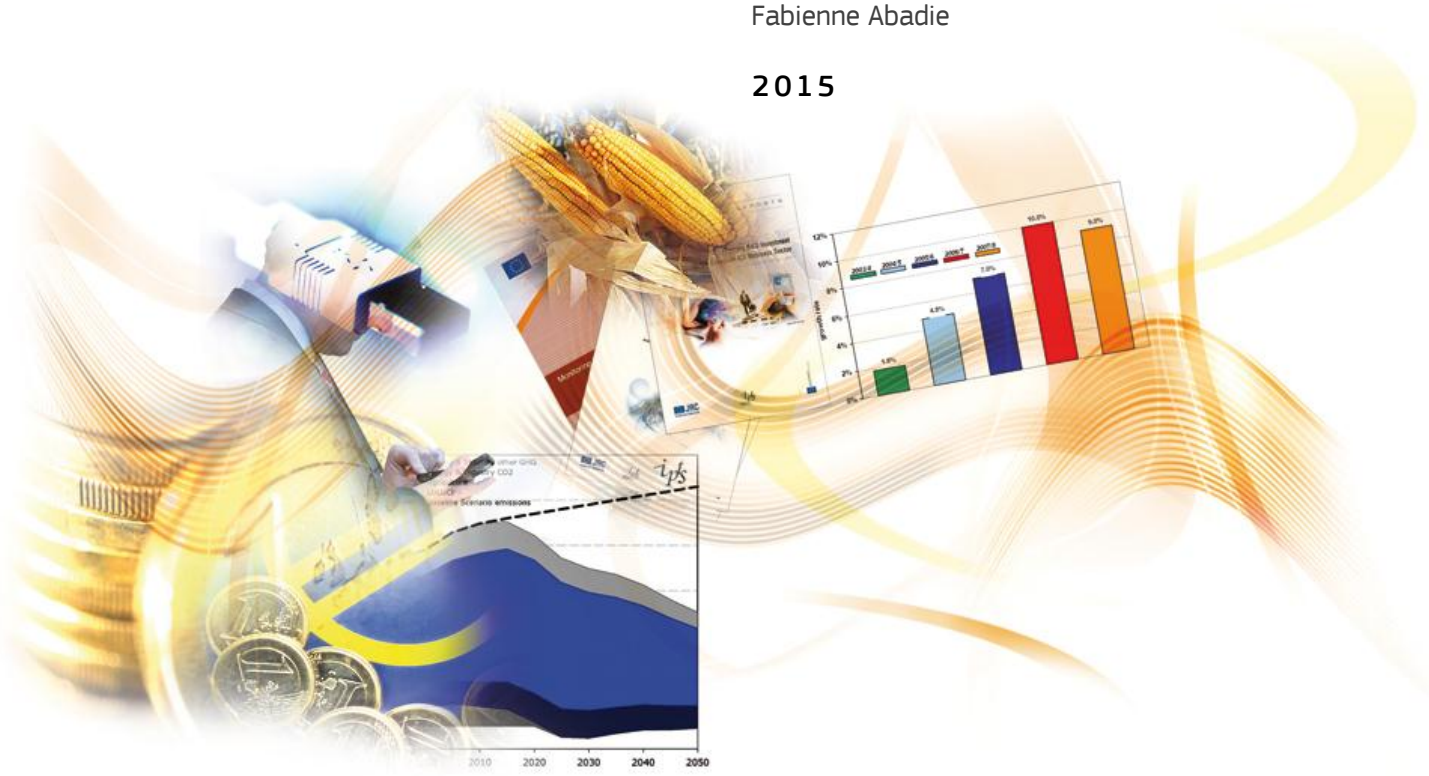

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Abstract
Renewing Health is a European project (February 2010-December 2013), partly funded by the European Union under the ICT Policy Support Programme, part of the Competitiveness and Innovation framework Programme (CIP), with a total budget of €14 million and European co-financing of €7 million. The project aimed to implement health-related ICT services through large-scale real-life test beds for the validation and subsequent evaluation of innovative eHealth services, using a patient-centred approach and a rigorous common assessment methodology.
This case study focuses on the Austrian Partner of the project: the Carinthia region and, more precisely, KABEG (Krankenanstalten Betriebsgesellschaft), the hospital management company in the region.
In RENEWING HEALTH, KABEG integrated a set of telemonitoring solutions into their existing systems for two target groups - patients suffering from Diabetes Mellitus Type II and patients suffering from COPD – in order to carry out two pilots to test the effects of the resulting system.

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Preface

The Strategic Intelligence Monitor on Personal Health Systems (SIMPHS) research started in 2009 with the analysis of the market for Remote Patient Monitoring and Treatment (RMT) within Personal Health Systems (PHS). This approach was complemented in a second phase (SIMPHS2) with the analysis of the demand side, focusing on needs, demands and experiences of PHS by healthcare producing units (e.g. hospitals, primary care centres), healthcare professionals, healthcare authorities and patients amongst others.

Building on the lessons learnt from SIMPHS2 and from the European Innovation Partnership on Active and Healthy Ageing initiative, SIMPHS3 aims to explore the factors that lead to successful deployment of integrated care and independent living, and define the best operational practices and guidelines for further deployment in Europe. This case study report is one of a series of case studies developed to achieve these objectives.

The outcomes of SIMPHS2 are presented in a series of public reports which discuss the role of governance, innovation and impact assessment in enabling integrated care deployment. In addition, through the qualitative analysis of 27 Telehealth, Telecare and Integrated Care projects implemented across 20 regions in eight European countries investigated in SIMPHS2, eight facilitators have been identified, based on Suter's ten key principles for successful health systems integration.

The eight main facilitators identified among these as necessary for successful deployment and adoption of telehealth, telecare and integrated care in European regions are:

- Reorganisation of services
- Patient focus
- Governance mechanisms
- Interoperable information systems
- Policy commitment,
- Engaged professionals
- National investments and funding programmes, and
- Incentives and financing.

These eight facilitators have guided the analysis of the cases studied in SIMPHS3 and a graph showing the relative importance of each facilitator is presented in each case study.

In addition to the above facilitators analysed in each case report, a specific section is dedicated to the analysis of care integration. It should be noted that the definition of vertical and horizontal integration used in this research is taken from the scientific literature in the field of integrated care.[1] This definition differs from the one mentioned in the European Innovation Partnership on Active and Healthy Ageing Strategic Implementation Plan.[2] We define horizontal integration as the situation where similar organisations/units at the same level join together (e.g. two hospitals) and vertical integration as the combination of different organisations/units at different level (e.g. hospital, primary care and social care).

[1] Kodner, D. (2009). All together now: A conceptual Exploration of Integrated Care.

[2] http://ec.europa.eu/research/innovation-union/pdf/active-healthy-ageing/steering-group/operational_plan.pdf (page 27)

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Case outlook

Renewing Health was a European project (February 2010-December 2013), partially funded by the European Union under the ICT Policy Support Programme, part of the Competitiveness and Innovation framework Programme (CIP), with a total budget of €14 million and European co-financing of €7 million. The project aimed to implement health-related ICT services through large-scale real-life test beds for the validation and subsequent evaluation of innovative eHealth services, using a patient-centred approach and a rigorous common assessment methodology.

It involved a consortium of 9 European regions in: Austria, Italy, Denmark, Sweden, Norway, Spain, Finland, Greece and Germany. One of the pre-requisites of the CIP programme for the projects was the existence of developed solutions that could be scaled up and tested as pilots. In the case of Renewing Health, the participating regions had already implemented some operational solutions related to the telemonitoring and the treatment of chronic patients suffering from diabetes, chronic obstructive pulmonary disease (COPD) or cardiovascular disease (CVD) at local level. The services included self-management of diseases for the patients, promoting compliance to treatment and helping healthcare professionals to detect early signs of worsening in the monitored pathologies. During the lifespan of the project, these existing solutions were scaled up and integrated into the local health information systems in order to be tested as pilots in the different project settings.

This case study focuses on the Austrian Partner of the project: the Carinthia region and, more precisely, KABEG (Krankenanstalten Betriebsgesellschaft), the hospital management company in the region.

In RENEWING HEALTH, KABEG integrated a set of telemonitoring solutions into their existing systems for two target groups - patients suffering from Diabetes Mellitus Type II and patients suffering from COPD – in order to carry out two pilots which aimed to test the effects of the resulting system. Prior to the project, KABEG already had a system in place for the collection of nursing data, as well as disease management processes for chronic patients suffering from diabetes, and to some extent for patients with COPD. The aim of the Carinthian telemonitoring project within Renewing Health was to establish a permanent infrastructure and an integrated treatment process for Diabetes Mellitus Type II and COPD using integrated electronic systems. The services targeted diabetes and COPD in the outpatient areas of three KABEG hospitals, which cooperated directly with the patient, or with the treating nursing homes and mobile nurses. Patients measured some parameters (blood sugar, blood pressure and body weight in the case of diabetes; COPD Assessment test and body weight in the case of COPD) every day, using blood sugar meters, scales and blood pressure measuring devices provided for free, for automatic transmission of measurement readings. Patients were empowered to do the readings themselves. However, in cases where patients were assisted by home nurses, the latter were trained to use the service for them. These measurements were automatically registered in the Health Information System (HIS) on a weekly basis for diabetes, monthly for COPD or immediately if measurement values fell outside a given range, and therefore required immediate attention by healthcare providers. The responsible General Practitioner (GP) checked the data to devise further treatment when required. Finally, a monthly report was sent to the patients and, if desired, to their GPs.

Within the scope of the Renewing Health project, KABEG recruited 193 diabetes patients and 65 COPD patients to evaluate the system. The results of the pilots showed that

telemonitoring based on the previously cited variables did not improve patient outcomes. In terms of economic impact, although the patients in the control group generated more costs due to the slight difference in hospital days, results are not conclusive due to differences between the characteristics of the compared groups.

The project was completed though some systems are still running: there are 11 diabetic patients who are still using the web portal to enter their parameters and to check their health progression over time. It is unclear whether the services will be mainstreamed in the future. Regarding COPD, as the results of the trials were not conclusive, the implementation of a telemonitoring solution for COPD patients was considered low priority, pending further studies. In the case of diabetes the results of the trials demonstrated a reduction in costs, but with low statistical significance. Organisational issues and costs need to be addressed in order to mainstream the service.

In relation to government settings and policy, it is worth mentioning that Austria is preparing a Health Reform which includes eHealth and telemedicine. Until then, the potential regulatory changes that may occur and the possible scenarios for further eHealth implementation remain unclear. However, KABEG plans include the implementation of their system into hospitals and other institutions. KABEG aims to get at least 30 patients into permanent care, and a further increase (50%) of patients is planned for 2016. There are also pending negotiations with other health institutions, e.g. the local health insurance company, where the system could be used in ambulatory care.

1 Background

1.1 Austria

The Republic of Austria is a federal republic of roughly 8.5 million people in Central Europe. It is landlocked and bordered by the Czech Republic and Germany to the north, Hungary and Slovakia to the east, Slovenia and Italy to the south, and Switzerland and Liechtenstein to the west. The territory of Austria covers 83,855 square kilometres and has a temperate and alpine climate. Austria's terrain is highly mountainous, lying within the Alps; only 32% of the country is below 500 metres and its highest point is 3,798 metres.

Today, Austria is a parliamentary representative democracy. The capital and largest city, with a population exceeding 1.7 million, is Vienna. Austria is one of the richest countries in the world, with a nominal per capita GDP of $46,330 .The country has developed a high standard of living and in 2011 was ranked 19th in the world for its Human Development Index. Austria has been a member of the United Nations since 1955, joined the European Union in 1995, and is a founder of the OECD. Austria also signed the Schengen Agreement in 1995, and adopted the European currency, the euro, in 1999.

As in the rest of OECD countries, the Austrian population is still ageing, although it is in the final stage of this demographic transition. The proportion of under 15 year olds is expected to drop to 14.3% (from 17% in 2000), while the proportion of over 64 year olds is set to rise to 19.5% (from 15.5%) by 2020.

As a federal republic, Austria is divided into nine states (Bundesländer). The states are not mere administrative divisions but have some legislative authority distinct from the federal government, which is responsible for health care legislation and administration of the Health Care System and other important issues (food safety, military, monetary and banking systems).

The Constitutional Finance Law establishes a framework for financial relationships between the federal government, the regions and the local authorities. Moreover, it states how taxes are allocated at the different levels.

1.2 The Austrian Health System

The Austrian Health System provides universal coverage, including a wide range of benefits and high-quality care, to all Austrian and EU citizens. Free choice of providers and unrestricted access to all care levels (general practitioners, specialist physicians and hospitals) are characteristic features of the system. Population satisfaction is well above the EU average. Income-related inequality in health has increased since 2005, although it is still relatively low compared to other countries. The health-care system has been shaped by both the federal structure of the state and a tradition of delegating responsibilities to self-governing stakeholders. On the one hand, this enables decentralised planning and governance, adjusted to local norms and preferences. On the other hand, it also leads to fragmentation of responsibilities and frequently results in inadequate coordination. This trend shows two main consequences: patient satisfaction, as the system provides tailored care depending on regional and personal demands; and budget imbalances: the costs of the health-care system are well above the EU15 average, both in absolute terms and as a percentage of GDP (10.8% vs. 10.4% in 2011) (European Commission, 2013). For this reason, efforts have been made for several years to achieve more joint planning, governance and financing of the health-care system at the federal and regional level. In

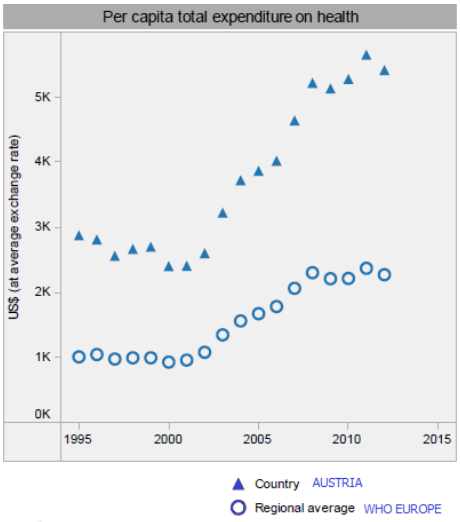
2005, Austria created the Federal Health Agency and regional agencies, in order to intensify the cross-stakeholder coordination and foster more homogeneous health care provision. However, as in any health system, a number of challenges remain. Table 1 presents general information about the Austrian Healthcare System. As shown in Figure 1 and Figure 2 below health expenditure per capita and as a percentage of GPD are above the European average.

Table 1 - General information about the Austrian Healthcare System

Geographical coverage km²	83,871
Inhabitants per km²	98.04
Number of inhabitants	8,495,000
Life expectancy at birth, years	78 males – 83 females[4]
GDP (2014), billion $	361,000
GDP per inhabitant (2014), $	42,600
General Practitioners /1,000 inhabitants (2010)	4.78
Nurses	7.83
National Budget for Health services management (2013), billion $	40,555
Health care professionals / 100,000 inhabitants	1,274.53
Health care budget, € per inhabitants (2013)	5,066.02
Hospital beds (2011)	68,758
Hospital beds/1,000 habitants (2012)	8.2

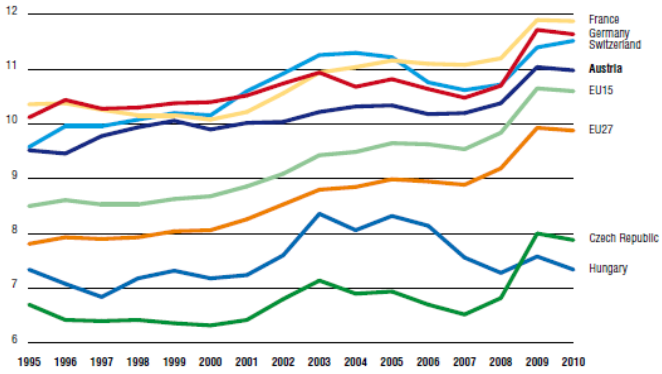
Source: (Hofmarcher, 2013) and WHO

Figure 1 - Health expenditure per capita in Austria and in the Europe WHO's region



Source (Hofmarcher, 2013)

Figure 2 - Evolution of health systems expenditure as % of GDP



Source (Hofmarcher, 2013)

According to the 2013 health system review on Austria (Hofmarcher, 2013) and WHO 2013[3] data, Austrians are much more satisfied with their health system than most other Europeans. This could be explained by the high level of coverage and provider choice that Austrian patients generally enjoy and by the decentralised planning and governance that allows the system to cater for local needs and preferences.

Nevertheless, there are important structural imbalances in healthcare provision, with an oversized hospital sector and insufficient resources for ambulatory care and preventive medicine. Austria also has stark regional differences in utilisation, in both curative and preventative services, including hospital beds, specialist physicians, outpatient rehabilitation, psychosocial and psychotherapeutic care and nursing. There are clear social inequalities in the use of medical services, such as preventive health check-ups, immunisation or dentistry. One of the key weaknesses of the health-care system stems from the scarce funds allocated to the prevention of illnesses and conditions. Spending on preventive medicine, at 2% of total health spending, is significantly lower than the EU15 and OECD average (both 3%) (Hofmarcher, 2013), and also has a below-average rate of growth. It remains to be seen whether the focus on health promotion and prevention of the 'framework health goals' approved in 2012 will be translated into precise measures, whether clear responsibilities for implementation can be assigned, and whether sufficient funding will be made available. This would probably improve the health of the Austrian population and would help to reduce costs associated with preventable diseases.

This lack of investment in prevention may have been the trigger for the increased incidence of preventable diseases. Consequently, non-infectious preventable diseases such as cardiovascular problems and neoplasms associated with smoking are important causes for hospital stays and death in Austria. Life-style habits may also affect this trend, especially in young people (27% of Austrian 15-year-olds smoke, 17% in OECD). Moreover obesity rates have increased remarkably in the last years (the prevalence rate of obesity in adults has increased from 8.5% to 12.8% in the period 1990 - 2010) (OECD, 2012).

The Federal Constitutional Law stipulates that responsibility for regulation of most health-care system areas lies primarily with the federal government, which handles it through 'the Federal Ministry for Health issues'. The latter is responsible for the supervision of hospital and ambulatory care and related legislation. Nevertheless, the Regional Health Funds are the operating bodies in hospital care, and they must ensure hospital bed capacity and financing.

Each Federal State has its own governing body, called the Regional Health Platform, in which all the relevant stakeholders are represented (Federal Government, Land, local authorities and Chambers of Physicians).

In the ambulatory and rehabilitation sectors, as well as in the field of medication, healthcare is organised through negotiations between the 22 Social Security Institutions or the Federation of Austrian Social Security Institutions on the one hand, and the Chambers of Physicians and pharmacy boards (which are organised as public law bodies), the statutory professional associations of midwives and other healthcare professions on the other. This cooperation works within a legally-defined framework to safeguard care and the financing of care. In some fields, social health insurers fulfil their obligation to ensure care provision through their own facilities. Social Security Institutions work as self-governing bodies, and cover some services like health insurance, pension benefits and work accident

[3] http://www.who.int/countries/aut/en

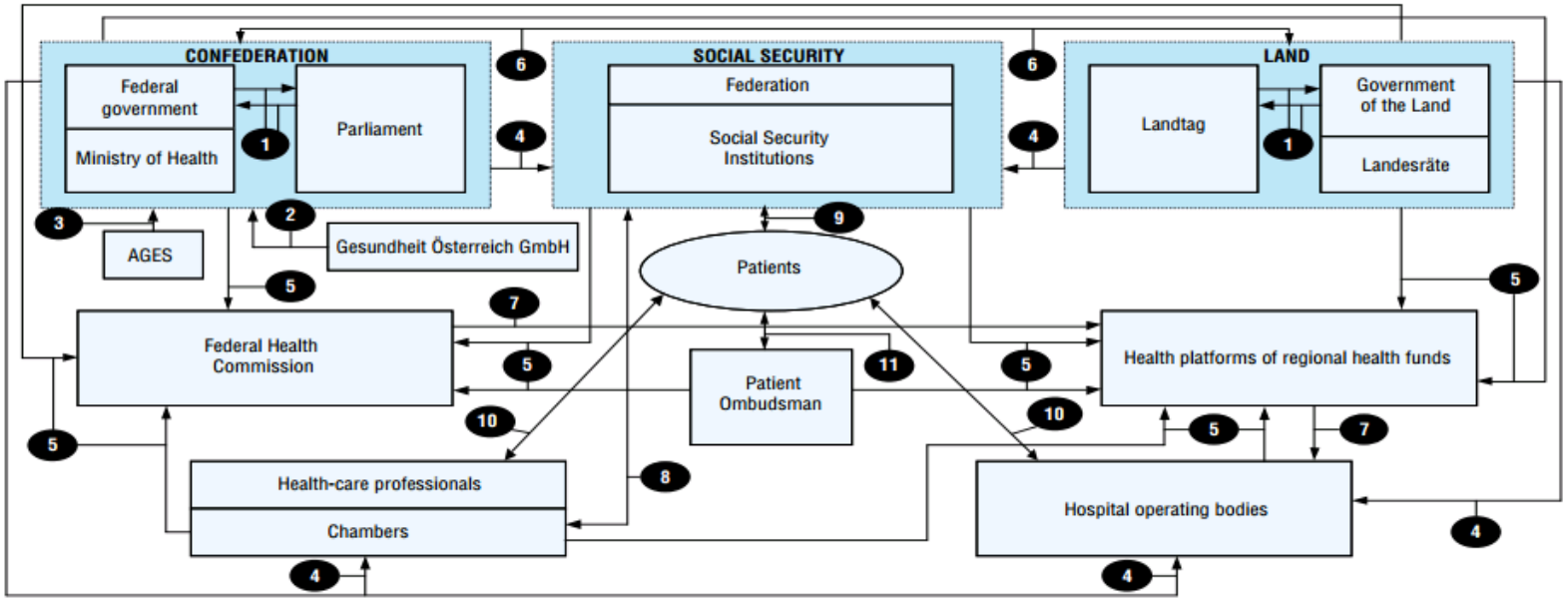
insurance. On the basis of agreements ('state contract'), the federal and regional authorities are mutually obliged to safeguard health-care provisioning in their areas of responsibility.

There are other important institutions involved in the implementation of health care:

- The Supreme Health Board which is a medical-scientific committee which advises the Health Ministry on medical questions.
- Gesundheit Österreich GmbH (GÖG), the institute for research and planning for the health care system which is divided into three sections: the Austrian Federal Institute for Health, the Healthy Austria Fund and the Federal Institute for Quality in the Health Service.
- The Austrian Agency for Food and Health Safety (AGES) which is mandated at national level to carry out a variety of tasks in the field of food safety.
- The Federal Health Agency, a public fund and a separate legal entity at federal level. The Federal Health Agency is the central facility for superregional and cross-sectional planning, governance and finance of the healthcare system. Federal resources are distributed by the Federal Health Agency to the nine regional health funds in accordance with a pre-agreed schema, established by the Federal Health Commission.
- The Federal Ministry of Labour, Social Affairs and Consumer Protection which is responsible for matters relating to social security, with the exception of health and occupational health insurance.
- The Federal Ministry of Science and Research, responsible for university education of physicians and for the legal and structural management of universities offering medical training
- The Federal Ministry of Finance which is responsible for taxation, budgeting, financial markets and financial equalisation, among others.

This decentralisation may generate fragmentation and lack of coordination, which makes the Austrian health system more costly than average and could hamper its performance. This is why there has been on-going reform since 2005, which has led to the creation of the Federal Health Agency and regional health platforms in order to intensify cross-stakeholder coordination at all levels and promote outpatient care. Figure 3 below shows an overview of all the different healthcare-providing bodies in Austria and their relationships.

Figure 3 - Flowchart of Health Care Responsibilities in Austria



(1) (a) Draft legislation by the federal government (minister responsible) to Parliament, or by the Land government (minister responsible at Land level) to the Landtag.
(b) Agreement of federal law by Parliament, or Land law by the Landtag.
(2) Support to the Federal Ministry of Health.
(3) Support to the Federal Ministry of Health, particularly in the context of licensing medication (AGES = Agency for Food and Health Safety).
(4) Health administration:
(a) at federal level (e.g. health-care policing, sanitary supervision of hospitals, monitoring of social security institutions and legal bodies representing interest groups);
(b) at Land level (e.g. concerning permits to build and run hospitals, licensing processes for outpatient clinics and group practices, implementation of planning in the region, investment finance).
(5) Appointment of members of the Federal Health Commission or regional health platforms.
(6) Consultation mechanism between the federal level and local and regional authorities with regard to legislative measures (laws and regulations) which require additional expenditure.
(7) (a) Sanction mechanism: the Federal Health Agency (Federal Health Commission) can withhold financial resources from a regional health fund (health platform) if it contravenes compulsory plans and guidelines regarding quality and documentation.
(b) Regional health funds (health platforms) can designate a corresponding sanction mechanism for hospitals.
(8) Negotiations on market entry, services and tariff charges (collective and individual contracts).
(9) Legal membership of social security institutions (compulsory insurance).
(10) (a) Fundamental freedom of choice for patients over hospitals and independently practising members of the health-care professions.
(b) Obligation to treat, which exists for public and private non-profit-making hospitals and contracted independently practising members health-care professionals.
(11) Legal representation of patients in every Land.

Source: Ministry of health.

The economic model of the Austrian health care system is supported mainly by two funding sources (Hofmarcher, 2013):

- Public funding (77.5% of total expenditure): These funds come from taxes and social insurance contributions. 99.9% of the Austrian population is a member of a health insurance company. Membership depends on the place of residence and profession, so the insurance companies do not compete for funds. Every member in the system has the right to access a broad set of services. Nevertheless, some of them require an extra payment (e.g. prescriptions). People fulfilling specific criteria related to their social circumstances are exempted from paying these charges.

  The guiding principle behind the system is that the provision of treatment must be sufficient, appropriate and should not exceed what is necessary.

- Private funding (22.5% of total expenditure): the Austrian population is entitled to contract extra health care services with private health providers. Some health insurance companies offer their members the possibility to choose a particular physician and better hospital facilities.

Payment of providers differs depending on the source of financing and the type of provider. Public and non-profit-making hospitals providing statutory services receive a DRG[4]-based budget. Most health insurance funds use a mixed payment system, combining flat-rate payments (per patient, per quarter – basic service compensation) and fee-for-service payments to pay for ambulatory services provided to their members. The composition of health spending is as follows:

- 43% for inpatient care (much higher than the OECD average). Austria has acknowledged that the inefficiency of its prevention plans might be the cause of this trend.
- 26% - ambulatory care
- 17% - pharmaceutical products
- 7.1 % - long-term care at home
- 3.6% - administration of health care.
- 1.5% - prevention
- 1.2% - organisation
- 1% - patient transport

As reported in Statistics Austria 2011 (Statistics Austria, 2011), the total public health expenditure in Austria in 2010 amounted to €23,689 million (94.7% of the total health budget) in 2010. The remaining €1,326 (5.3%) are invested in anticipating future needs and in research. More specifically, €456 million are dedicated to health research. These funds are allocated to support the clinical overheads of the three university hospitals and their research staff. This support has grown at a rate of 5.7% per year since 2005 (Hofmarcher, 2013).

[4] Disease Related Group

Figure 4 - Funds Origin

	Taxes and contributions	Raising funds and pooling	Expenditure in 2010, in € millions	% of health expenditure
Local authorities	Yield share from general tax revenue, including 0.642% of VAT income before distribution of revenue shares to local authorities, towards financing of public hospitals (= targeted grant)	Centralized/ decentralized	1109	4.7
Länder (including Vienna)	Yield share from general tax revenue, including 0.949% of VAT income before distribution of revenue shares to Länder.	Centralized/ decentralized	6 149[a]	26.0
Federation	1.416% of VAT income plus general tax income, e.g. funds raised under the Health and Social Sector Contribution Act (GSBG)	Centralized	995[b]	4.2
State, not including social insurance	–	–	8 253	–
Social insurance (spending on non-financial transactions)	On average, 7.65% of monthly gross income, up to contribution cap (approximately 50% in 2009) + contribution payments via the state, e.g. for pensioners and reimbursements for service costs (approx. 8%) + fees and cost-sharing (approx. 5%)	Centralized/ decentralized	15 436	65.2
Total public health expenditure	–	–	**23 689**	**100.0**

Source: Hofmarcher, 2013

In order to optimise healthcare provision in Austria, both the national Government and other stakeholders have created a legal framework that aims to facilitate the integration of ICT solutions into healthcare provision. The Health Reform Act of 2005, including the 'Health Telematics Act', defines the legal basis for implementing eHealth services in Austria. The first successful case of eHealth was the implementation of an e-card system back in 2005. Up to 8 million beneficiaries and 12,000 general practitioners were provided with an e-card comprising basic administrative data about the beneficiary (i.e. name, academic title, insurance number, card serial number and user group identification). The e-card works mainly as an e-Identification system, and provides access to other applications that require secure patient identification. The e-card does not store any medical or other health-related data.

The ELGA (Elektronischer Gesundheitsakt) Act, passed in Austria in 2012, creates the legal basis for the country's first national Electronic Health Record infrastructure, which will provide semantic interoperable sharing of several types of medical documents amongst Austrian healthcare providers. The ELGA system will not involve the central storage of all patient data. Instead, the service will only maintain a centralised registry of the locations of individual-related health data. Health data are defined as personal data that provide information about the physical or psychological state of an individual, including the data collected to assess the individual's state, as well as data collected for the purposes of preventive medicine or healthcare provision, for diagnosis, treatment or care methods, for provision of care, prescribed or taken medicines, medical aids, etc. In addition, the ELGA will comprise information about living wills, powers of attorney and a "patient summary" based on the application of patients' rights in cross-border healthcare. The ELGA system consists of the following components:

1. Patient Index,
2. Healthcare Provider Index,

3. Registry,
4. Data Storage,
5. Access Control Centre,
6. Logging System,
7. E-Health Access Point.

The health data stored in the ELGA system will make health data in electronic format available to authorised EHR-Healthcare Providers and EHR-Participants, without reference to location and time. The Austrian Ministry of Health will operate an Electronic Health-Directory Service (EHDS) that will (1) support the legitimate use of health data in electronic format, (2) improve information about health-related services, and (3) support planning activities and reporting. EHR-Healthcare Providers will be registered with the EHDS by authorised registration bodies, under the responsibility of the Federal Ministry of Health and the Federation of Austrian Social Insurance Carriers.

According to the ELGA Act, the following data should be available for hospitals, the General Accident Insurance and care institutions from 1 January 2015:

1. Clinical discharge reports from hospitals.
2. Laboratory results.
3. Results of diagnostic imaging by members of the medical profession.
4. Medication data, by members of the medical profession.
5. Medication data, by pharmacies or drug dispensing doctors at dispensation.
6. Other results.

From 1 July 2016, this information should be available for pharmacies, freelance doctors, group practices and authorised independent clinics. From 1 July 2017, private hospitals should be integrated into the ELGA system. According to the law, living wills, powers of attorney and authorised data of the medical registers should be integrated by 1 January 2017. Finally, on 1 July 2022, freelance dentists, dental group practices and independent dental clinics should be integrated. As of today, physicians are obliged to introduce data about the patients they attend in the common health data repository.

1.3 Carinthia region

Carinthia (German: Kärnten) is in the Eastern Alps in the southernmost Austrian state (Land). Carinthia has 560,000 inhabitants, about 1,000 physicians in the outpatient area and some 950 hospital physicians. There are 11 hospitals of different sizes and specialisations, 12 homecare organisations and nearly 60 care units for citizens who need care, often older people.

In 2000, the Carinthian Regional Health Board started a project to establish coordinated telemedicine in Carinthia. The main goals were to implement or provide:

- Teleradiology between different hospitals in acute (1,100 cases a year) and routine cases,
- A description of former treatments (about 1,400 a year), also provided by radiological institutes,

- A Carinthian (in-)patient record (>800,000 patients with 3.8 million hospital stays),
- Secure clinical records for the outpatient area (more than 50,000 a year, strongly increasing).

In Carinthia, the collection of clinical data in homes is currently in place as part of the homecare assistance package for patients suffering from chronic diabetes and COPD. However, the use of remote patient monitoring systems is not foreseen. Measurements are taken with traditional medical devices without communication facilities and are manually entered into a PDA for later transmission to the relevant hospital.

In addition, the regional Ministry of Social Affairs implemented a GPRS/UMTS-based mobile documentation system for homecare treatment, using centralised storage and communication between the providers involved. These include 12 nursing organisations with about 1,500 employees, which provide about 880,000 hours of assistance to thousands of patients, many of whom are chronically ill. These organisations are co-financed by the Carinthian Government. The staff of all these organisations currently uses the same mobile system to collect and transmit data from patients' homes.

1.4 KABEG

KABEG (Landeskrankenanstalten-Betriebsgesellschaft) is the company that manages the five regional hospitals of Carinthia (Klagenfurt, Villach, Wolfsberg, Laas and the Gailtal Clinic). They have 2,700 beds for regular patients and 266 for chronic patients. Its 6,350 employees provide inpatient care for 70-80% of the Carinthian population. It is a body constituted under public law with its own legal status. It was founded under the Hospital Operations Act of 25.2.1993 (now the Carinthian Hospital Operations Act or KABEG). KABEG manages and controls the use of funds in the interests of the taxpayer, by strictly adhering to commercial guidelines and the objectives set by the regional government. The main focus is on the management, co-ordination and continued, dynamic development of the region's hospitals, with particular emphasis on investment planning and organisational development[5].

As a company working within the healthcare market, KABEG undertakes to safeguard core medical and nursing skills with a fully operational risk management system.

In 2002, the Regional Health Board of Carinthia established a Coordinating Unit for all Carinthian e-health and telemedicine activities. Since then, KABEG has worked on the design and implementation of new initiatives in this field. Moreover, KABEG has been the main coordinator of this Unit in which physicians, public insurance companies, social service departments and delegates from different healthcare organisations were also involved.

Three hospitals from KAGEG have participated in Renewing Health: Klagenfurt, Laas and Villach. In addition, six outpatient care clinics, two nursing homes and one mobile nursing organisation have collaborated.

The aim of the pilot in Carinthia was to establish and extend the services and infrastructure required to manage and assess chronic patients with COPD and Diabetes. A few patients are still using the system and KABEG has plans to further expand the services.

[5] Information provided by KABEG

2 Integrated care analysis

2.1 Dimensions of integration

KABEG was responsible for the implementation of the Renewing Health project in Carinthia. The pilots conducted by KABEG as part of the Renewing Health project that focused on two target groups: Type II Diabetes Mellitus (T2DM) patients and Chronic Obstructive Pulmonary Disease (COPD) patients. Most of the professionals (Diabetes and COPD physicians, home nurses, etc.) who were involved in the project worked for KABEG. In addition, mobile nurses from the Austrian Red Cross and independent General Practitioners (GP) also participated in the initiative. From the beginning, KABEG defined the responsibilities of each professional for the remit of the project. For instance, independent GPs did not have access to the patient's history and his or her physiological parameters but were informed about the health condition of the patients by the hospitals' outpatient departments.

For the lifespan of the project, one can say that there was some integration between the three different hospitals from KABEG, and also between the other professionals and institutions, and KABEG played a central role in coordinating the initiative. The type of integration consisted mainly of information sharing and the clear definition of responsibilities amongst professionals, while organisational mechanisms remained separate.

In order to support the flow of information among the different organisations involved in the project, KABEG developed a set of guidelines on communication and cooperation between mobile nurses, home nurses, general practitioners and GPs in the outpatient area. Moreover, a framework was created to integrate different Health Information Systems and different services. This framework included the devices that acquired and automatically transmitted information about physiological parameters (HbA1c, blood sugar, blood pressure for diabetes) to the HIS; CDA documents that ensured the integrity and security of the information; a call centre for supporting COPD patients; dedicated software installed on the mobile nurses' PDAs that allowed them to upload patient data and, finally, the web portal, that allowed patients to upload their parameters and supported them with reports and reminders. Doctors in the outpatient area could use the platform to check the health status of patients and to change Disease Management Processes (DMP). These changes were recorded in reports and shared with the GPs in Primary Care and with the nurses involved.

2.2 Impact

The main objective of the Renewing Health pilots in Austria was to test the effects of integrated services on patients' quality of life, clinical parameters and patients' satisfaction and to evaluate organisational framework and economic aspects, through a randomised controlled trial.

As requested by the Renewing Health project, the Model for Assessment of Telemedicine (MAST) (Kidholm, 2012) approach was used to assess the impact. The results are described in a publicly-available summary report (Steinberger H, 2014) and in two more detailed internal reports that were used to generate this case study.

Regarding the impact on patient outcomes, quality of life - measured through the SF36 questionnaire (Jenkinson, 1993) (Ware, 1992) - was the primary clinical outcome

considered. In addition, as a proxy for diabetes control, HbA1c6 levels were measured and for COPD, the St. George's Respiratory questionnaires[7] were used. As secondary outcomes, the number of hospitalisations and clinical visits, and patient acceptance were measured.

Patient acceptance was evaluated using the Service User Technology Acceptability Questionnaire (SUTAQ) (Newman, 2011). This questionnaire includes 22 items (or questions) expressed on a 6-point Likert scale (from 1= 'Strongly agree' to 6= 'Strongly Disagree'). The dimensions evaluated comprise Utility, Effect on health status, Effects on access to care, Effect on healthcare / social care, Privacy, Suitability and Satisfaction. The patients in the intervention group answered this questionnaire after 3 months and again after 12 months.

For diabetes, KABEG carried out a randomised controlled parallel-group unblinded trial in the 3 hospitals. 193 Type II Diabetes Mellitus patients (older than 18 and with HbA1c >= 6.5) were recruited, out of which 162 completed the study: 101 (out of the 117 recruited) in the intervention group and 61 (out of the 76 recruited) in the control group. Data were collected at the beginning of the trial, during the study period and one year after start.

The SF36 questionnaire was used and HbA1c levels were measured at the beginning of the study and after 12 months for both groups, in order to evaluate the primary clinical outcome of the new intervention. The results did not show any significant differences between groups as a result of the intervention (see Table 5 in Annex). Besides, secondary clinical outcomes such as cholesterol levels, body weight, Body Mass Index (BMI), blood pressure and triglyceride levels were also monitored. For those variables, no significant effect was found as a result of the intervention (see Table 6 in Annex). Overall, it can be concluded that from a clinical point of view, the new services based on telemonitoring did not bring any statistically significant differences in any of the clinical variables assessed.

KABEG did not register any remarkable impact on the number of clinical visits. Especially in the case of Diabetes, patients still had to visit primary care in order to monitor and assess their HbA1c levels every three months. This made it difficult to assess the use of services since both groups attended the clinical centre very often, no matter how they felt. Thus, in order to evaluate the impact another measure would be needed.

The evaluation of patient acceptance using the SUTAQ questionnaire, which patients in the intervention group answered after 3 and 12 months (see results in Table 7 Annex), showed an improvement in how patients perceived quality of care during the study. Personal concerns were moderate and improved during the study. Satisfaction was high throughout the study, although patients did not find the service suitable as a substitute to actual care.

In addition, 65 COPD patients (COPD Gold Class III or IV) were included in the study: around one third in the control group (28 patients) and two thirds in the intervention group (37). These low numbers reflect the difficulties linked to the recruitment of COPD patients, whose advanced age and fragile health condition usually mean a relative lack of interest in participating and lack of skills to use the system. Data were collected at the beginning, during the treatment process and at the end of the trial after one year. Baseline characteristics showed significant differences between the intervention and the control group, making it difficult to generalise the results.

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6 http://www.nlm.nih.gov/medlineplus/ency/article/003640.htm

7 http://www.thoracic.org/assemblies/srn/questionaires/sgrq.php

In the COPD trial, the SF36 and St. George's Respiratory questionnaires analysis did not show differences between groups (see Table 8 and Table 9). Again, no differences were found in the frequency of visits. Regarding patient acceptance (see Table 10), the results suggested that how the care received was perceived was rather good at the start but worsened significantly after one year, meaning that the degree of satisfaction with the care received decreased. Patients' views on whether the service should become a substitute for traditional care also deteriorated over time. On the other hand, patients' concerns and privacy issues remained quite moderate during the use of telemonitoring. The decreased satisfaction could therefore be related to organisational changes and to the way eHealth-supported treatment was provided in the clinics involved.

For the evaluation of the economic impact, the societal perspective was chosen, which is the most comprehensive as it includes all costs related to hospital, general practitioners, medical specialists, patients and their relatives. Table 11 in Annex gives an overview of the type of costs considered in the analysis, the methods for data collection and the estimations obtained at patient or group level.

KABEG carried out a cost-minimisation analysis (CMA) on both the control and intervention groups, which was based on the assumption that the outcomes were equivalent in each group in order to determine the least-cost alternative (see Table 2).

Table 2 - Least-cost table, DIABETES and COPD

	Intervention	Control
Total running costs DIABETES	€2,006.33	€2,120.93
CMA=min(Ct-Ca)	-€114.60	
Total running costs COPD	€6,056.73	€7,674.63
CMA=min(Ct-Ca)	-€1,617.90	

During the Renewing Health project, it was estimated that a patient of the control group generated an extra €114.60 costs per year in the case of diabetes and €1,617.90 per year in the case of COPD. These costs included intramural (inpatient days, outpatient visits), extramural (visits at the general practitioner and the medical specialist) and, for the intervention group, telemonitoring (devices, visitations) costs (see Table 12 in Annex.

As shown in Table 13 in Annex, the greatest difference between control and intervention groups related to inpatient stays. Patients in the control group incurred more stays with more bed-days, which was particularly the case for patients with COPD. However, because of the differences in the baseline characteristics these results are not conclusive.

2.3 Drivers and barriers

The main drivers of the case are technology on the one hand and the fact that specific funding was received to develop and pilot the services on the other.

KABEG aimed to build and maintain an interface which would be as simple as possible. This is an important point, as the users and the target population are older people who might not be able to handle complex systems. In addition, KABEG built the services upon an already existing and running HIS. The three hospitals were already using a robust information system. The integration of the new data and communication platform was therefore easy from a technological point of view. Moreover, the professionals involved

were used to this ICT environment and the training they received was neither too complicated nor too time consuming.

Besides, despite the complexity of the Austrian Health System and the multiple funding sources, sufficient funding was made available according to the experts consulted. The regional government was committed to the initiative and insurance companies supported it from the very beginning.

With regard to barriers, the lack of a specific board for telemedicine applications hindered the implementation of the initiative. Problems related to the initial workload, technical support, the coordination of the involved organisations, and patient motivation would have been easier to deal with through a managing body.

Another crucial barrier was the recruitment of patients, especially in the case of COPD. Patients must be carefully recruited for the treatment to be successful. Their age and cognitive capacities must be considered, as they have to deal with technology. Moreover, they have to be willing to join the initiative and participate actively. In addition, COPD patients are generally older, and their health status is worse than that of diabetes patients, so recruitment in this population group was more difficult.

The additional workload was also underestimated. The Renewing Health services did not substitute any other running service but constituted an additional task in the professionals' daily activity which raised concerns or even complaints.

The initiative also encountered some difficulties with the introduction of new protocols. Clinical partners already used disease management protocols to treat chronic patients, which made it difficult to introduce new disease management protocols, especially with regard to the frequency of physiological parameter data collection and the amount of stored data. The integration of physiological parameters of chronic patients in the hospital information system is seen as an advantage, but established standard organisational procedures are not easy to change. Some stakeholders are less willing to change than others which can hinder further development.

In addition, participating in studies often means additional tasks which usually come with direct additional resources. This was not the case in Renewing Health, sometimes making it difficult to involve some professionals.

The lack of official communication standards amongst the involved institutions also hindered implementation. KABEG created ad hoc standards for the remit of the project, but if the service were to be mainstreamed, this would have to be revised and agreed upon. It was particularly difficult to coordinate home nurses and Red Cross nurses, which resulted in disruptions to patient care.

Finally, defining a funding model for a health service in Austria is complex as it is a Federal State with many political levels and involving many different entities. For instance, hospitals are financed by the central government, the region and public insurance companies. Home nursing is financed by the regional government and mobile nursing is financed by the region and by patients. Outpatient care is supported by public insurance companies. Indeed, this complex system delayed the implementation of Renewing Health.

As mentioned before, the results of the pilots carried out within the Renewing Health project are not conclusive enough to warrant the integration of the telemonitoring system into routine practice. Although the pilots demonstrated some cost reductions in the case of patients with diabetes, the return on investment that might result from the integration of a

telemonitoring solution into routine practice is unclear. So far, there is no dedicated funding for eHealth or telemonitoring activities although there is ongoing work to create agreements between the Austrian government and the various regional governments, which might enable and facilitate eHealth implementation. These agreements will be common for all national and regional eHealth initiatives and will address all health providers in all regions. One of the main goals of these agreements is the use of ICTs to facilitate cooperation, coordination and understanding among different bodies, which has to be achieved by 2016.

2.4 Health professional and patients

The professionals involved in the pilot project included practitioners from the 3 KABEG hospitals, the Austrian Red Cross home nurses and independent General Practitioners.

The nurses and specialists at the hospitals were responsible for recruiting the study participants, while nurses from the Red Cross delivered home care. Specialists were responsible for reviewing the digital reports of the data submitted by the patients, for inviting them to additional examinations if necessary, and for informing them about their health status.

Professionals from KABEG and the Austrian Red Cross received specific training prior to the start of the project. Home nurses of the Austrian Red Cross received an introduction and training into the new functions of the updated PDA system and additional devices (Bluetooth blood pressure and blood glucose measurement devices) together with the new version of their system. Professionals in the hospitals were trained for the system changes made to the usual hospital software. These changes were minimal and therefore only required a short introduction. Medical doctors received individual training of around 75 min and nurses of around 45min.

The perception of professionals about the new telemonitoring system was analysed by KABEG through focus interviews carried out in two groups (one composed of health professionals and the other of technical and organisational support staff) and through questionnaires. In general, professionals had a good perception and acceptance of the telemonitoring system. However some issues arose such as usability problems with the Active Devices and the additional workload that the implementation of the Renewing Health system generated.

Patients were considered by KABEG as central to the project and as people who must be treated in a special way. Like every project involving people, Renewing Health had to ensure that all the principles of bioethics and medical ethics were fulfilled. The project complied with the ethical principles included in Table 3 (see Section 2.6).

2.5 Information and Communication Technologies

The implementation of the Renewing Health integration strategy is based on the incorporation of Personal Health Systems into the existing Health Information Systems, expanding the functionalities to collect, send and receive CDA (i.e. Clinical Document Architecture) standard documents. These CDA documents enable and facilitate the communication between stakeholders (through the health portal and the mobile nursing system) and with the rest of the Austrian health system.

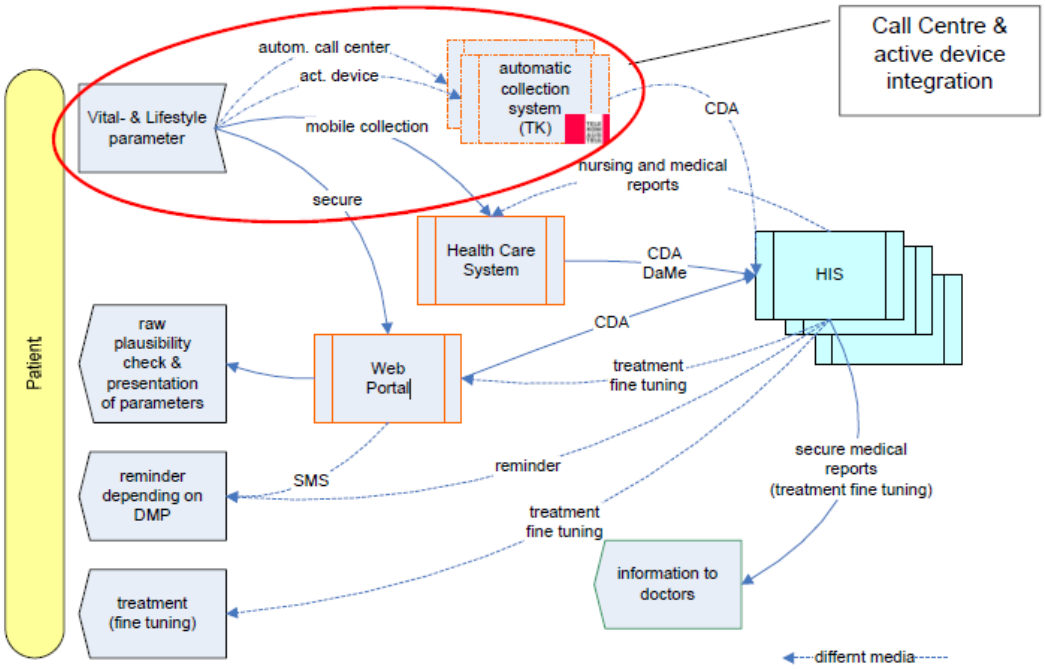
KABEG had already developed its own Health Information System in the three hospitals under its responsibility prior to the start of the project. In addition, three other companies

were involved in the development of the IT infrastructure. The Carinthia State was responsible for organisational tasks such as the coordination of all the entities and providers working on the IT system. Moreover, the State's IT department hosted and handled the Health Web Portal, which was developed by Groiss Informatics. Ilogs, an Austrian telemedicine company, developed the PDA Software for mobile nursery (called Mocca).

A1 Telekom Austria, the leading mobile and communication operator in Austria supported the project by providing KABEG's hospitals and the recruited COPD patients with the devices they needed to implement the intervention. Moreover they built the network for data exchange, installed the devices at the patients' homes and offered support from their technical department in order to ensure proper functioning[8].

All communications were supported through an internal Internet-based network, a call centre and SMS (reminder for patients). Users and professionals were assigned an account and credentials to enter the web portal. Each web portal user had access to certain areas. Patients had access to some information regarding their treatment, while physicians were only given access to the history of those patients under their responsibility.

Figure 5 - Data Flow in KABEG's ICT infrastructure



Source: KABEG

As illustrated in Figure 5, the information was collected at the patient's home in four ways: 1) through the Active Devices, which automatically sent the information to the HIS; 2) via nurses' PDAs; 3) by manual collection with traditional devices, the data being entered into

8, http://www.a1.net/newsroom/en/2011/05/a1-telekom-austria-unterstutzt-e-health-initiative-innovatives-eu-projekt-offnet-karnten-die-tur-in-gesundheitsversorgung-der-zukunft/

the web portal via a personal computer or a smartphone; and 4) via the Call Centre, for the oldest patients.

All this information was sent to the Automatic Collecting System, which generated a CDA document. This document was subsequently stored in each patient history file in the HIS, and made available to the physicians in the outpatient area and the GPs. This information was used for Disease Management Process fine-tuning. Moreover, patients could see statistics in the web portal, which gave them an overview of their health condition. However, in order to get full information about their health condition, patients communicated with the outpatient departments.

The Mocca application was developed by Ilogs for the mobile nurses from the Red Cross to help them look after chronic patients during the Renewing Health pilot. The application included: 1) the Mocca planning module (i.e. the working schedule, resource management and route optimisation); 2) the Mocca mobile device, which allowed nurses to take measurements from patients; and 3) the Mocca care application which included healthcare documentation based on existing technical standards. KABEG's idea is to scale up its HIS and electronic network to the whole Austrian hospital health care system, ELGA. Indeed, the development of the KABEG HIS was aligned with ELGA in order to ensure better integration in the coming years when ELGA is ready. However, the Renewing Health project per se will not be not integrated

2.6 Governance and policy setting

To set up and run the project, KABEG defined the governance model and the processes to be followed by all stakeholders and the role of each professional involved. The legal framework did not have to be modified to implement the project since the Austrian legal system already supported eHealth activities. However, in order to continue in the future, some specific legislation may be needed to regulate communication and cooperation among the different tiers of healthcare. There is also a need for legislation to guarantee patients security and safety. A Health Care Reform is currently under discussion. This reform would affect the system at national level, and might be a trigger for scaling up projects such as Renewing Health. The Austrian government is cooperating with the regional Health Departments to design this Health Care Reform which will define regulations that clarify issues related to eHealth amongst others.

KABEG wanted to ensure compliance with certain ethical issues from the very beginning which is why they included guidelines in their initial protocol to that effect (see Table 3).

Table 3 - Ethical issues[9]

Issue	How the issue was addressed	Implementation
Patient autonomy	Consent to treatment	A patient information pack was created, staff were trained to deliver oral guidance on the written information, and patients' consent was recorded in writing. Patients could withdraw after considering the written guidance at any time.
Access and equality	Public information in different formats; available in clinics or hospitals	
Privacy and security	Consent to treatment	Cultural, religious and ethical issues are not included; SUTAQ provided insights into patients' perception about these topics.
Autonomy	Different kinds of telemonitoring and reminder systems were implemented, but no enforcement was foreseen	The patient had the possibility to choose the tool, and to decide whether to receive reminders or not.
Assessment of risk and benefit	Inclusion criteria and training	

KABEG developed the telemonitoring application and the study pilot in compliance with the existing legal framework. They aimed to comply with their social objectives and fulfil patients' rights, while avoiding possible future liability problems (see Table 4).

Table 4 - Legal issues[10]

Issue	How the issue was addressed	Implementation
Clinical accreditation	Only staff in the selected clinics participated	
Device certification	CE certificate	Only devices accepted by public insurance were supported
Information governance	Only for systems already in use or systems subject to agreement	Special privacy and security agreements Use of citizen card for User and patient identification possible Use of Information security systems by providers
Professional liability	Liability insurance	Treatments involving the use of telemedicine included

The project received strong support from policy makers who are working on plans for the possible implementation of ICT-based solutions, especially for diabetes, cardiovascular diseases and social care.

[9] Internal report provided by KABEG
[10] Internal deliverable provided by KABEG

2.7 Organisation and processes

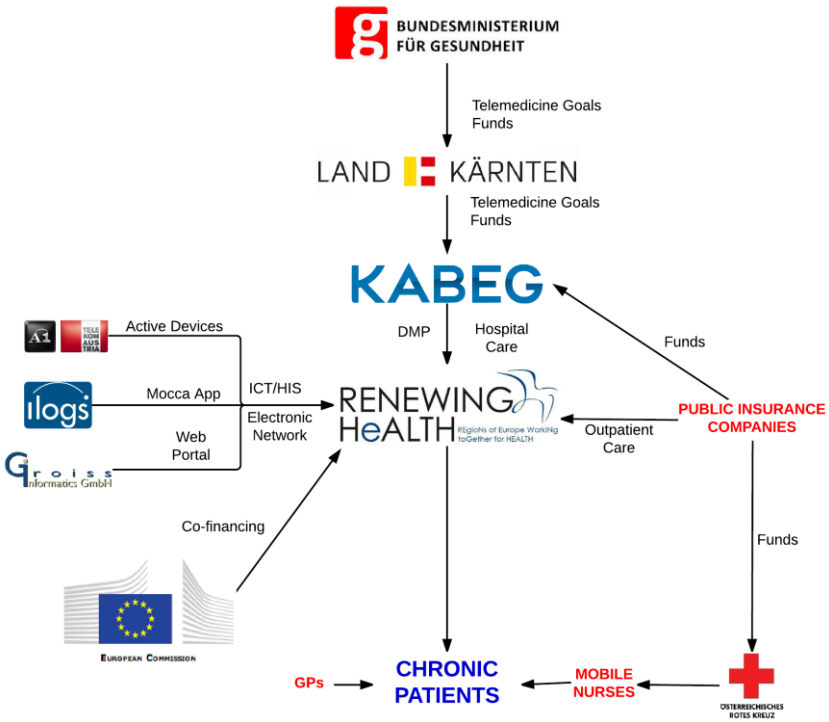
The implementation of Renewing Health in Carinthia was possible thanks to the cooperation of several organisations, under the leadership of KABEG. KABEG had the initial idea, recruited all the stakeholders, coordinated the initiative and made it possible to implement telemonitoring within the disease management processes in Carinthia. Moreover, most of the care professionals who were involved in the project worked for KABEG (the Diabetes and COPD physicians, home nurses, etc.).

The European Commission also played a key role in Renewing Health by financing 50% of the total budget for implementation (€400,000). The Austrian government and the Carinthia regional government support hospital system funds. They also established specific goals for the use of ICT in care provision as a way of reducing expenditure. Public Insurance Companies and Social Security Institutions also contributed to the Renewing Health project by providing outpatient care services and by financing part of hospital care.

Some technology companies were also involved in Renewing Health. They created, ran and maintained the Health Information System, the system for data collection and the electronic network which enabled personalised care provision. A1 Telekom designed and provided users with the measuring devices (Active Devices) and later developed the application for smartphones. Gross Informatics built the web portal for data collection and physician-patient communication. Ilogs developed the MOCCA application that was used by mobile nurses on their PDAs.

Finally, the Austrian Red Cross managed mobile nursing, with resources from Public Insurance Companies and private contributions. Independent General Practitioners (GP) did not get strongly involved in the initiative. KABEG gave them access to patients' history and physiological parameters in order to ensure good disease management and support decision making. Figure 6 illustrates the cooperation among all the above stakeholders.

Figure 6 - Organisations involved [authors' creation]



As coordinator of the initiative, KABEG developed a common Disease Management Process (thereafter DMP) that had to be supported by the overall system. This DMP was developed in collaboration with health professionals, mainly from KABEG, and all participating stakeholders were later trained in its implementation. Some changes were needed in order to enable the implementation of the new disease management process in all involved organisations. First of all, the involved organisations had already established protocols for dealing with chronic patients. The new DMP affected these protocols, especially the frequency of vital parameter data collection which also determined the amount of stored data. The integration of vital parameters on chronic patients in the hospital information system was seen as an advantage, but the modification of established standard organisational procedures was met with some resistance.

In order to coordinate the process between the involved stakeholders, several factors were taken into account. Nevertheless, the following difficulties emerged:

- The level of cooperation between GPs and especially nurses differed between clinics. Sometimes there was little will or possibility to cooperate between different professional groups.
- The involved hospitals had different approaches to the treatment of patients, some used a standard treatment process, others a case-by-case treatment process. Some treated primarily inpatients, others also dealt with outpatients.

KABEG was conscious that its communication system was not effective. Prior to the application of the Renewing Health intervention, all information exchange was based on e-mails. The communication was neither fast nor efficient enough, as doctors received too many e-mails related to their patients under diabetes treatment and it was difficult for them to determine which of them reported severe conditions or which events required fast response. Moreover, GPs needed to check their mail box very often if they wanted to be up to date. Therefore, KABEG modified the communication processes and remodelled the system in two ways:

1. **Internal Changes:**

- Implementation of the telemonitoring application: Results from periodic tests started to be stored in the patient record of the health information system (HIS). They therefore became available to doctors and nurses at any time and location. In total, the 193 Type II Diabetes Mellitus patients (older than 18 and HbA1c >= 6.5) and the 65 patients diagnosed with COPD who participated in the pilots uploaded information into the HIS during a period of 12 months.
- Day-to-day running of the service: the service had to be provided without the patient physically visiting the clinic. Important parameters about their disease status had to be assessed to make sure they fell within safe ranges in order to prevent sudden or/and critical worsening events. The GP established some thresholds for each patient after the initial examination. Those thresholds could be updated and re-set by the doctor depending on the patient's evolution.

2. **External Changes**

- Implementation of the telemonitoring application: Patients were empowered to care for themselves and live as independent a life as possible. However, they were not always able to carry out the treatment process or identify the worsening conditions

that needed a fast-response as patients did not always enter all the parameters. In order to overcome these constraints, KABEG developed an SMS-based reminder system, which was much faster than a web portal or a call centre. This system sends patients reminders by SMS when they fail to enter their parameters, and also sends emails to physicians if they fail to comply.

- Day-to-day running of the service: it became possible to make additional contacts with patients by telephone. Patients often wished to communicate with their care professionals more often than the usual contacts regarding their treatment. Practitioners in the outpatient area were not used to dealing with additional reports concerning the status of the disease, and clarifications and changes to the routine practice were needed in order to enable this.

2.8 Reimbursement model and economic flow

KABEG received €400,000 EU funding for Renewing Health which was used mainly for implementing the study and managing the project. If Renewing Health is implemented more widely in the future, it would be necessary to develop a legal framework which clarifies financing sources. The Austrian funding model is complex, and economic flows come from different administrative bodies (Federal Government, Region, Insurance Companies).

Renewing Health involved mainly the outpatient area, which is fully covered by insurance companies. This facilitated the implementation of the initiative. Besides, home nursing and mobile nursing were supported by the Regional Government, which was fully committed to the initiative. The telemedicine services were included in the regular and universal health package of services without additional payment, which made it easy to include patients.

In general, patients had no costs or nearly none. The services were partly free during the study. The Call Centre had to be paid by the patients themselves (about 3€ a month), for the web portal the patients need to access the internet via PC or Smartphone, so there were very low running costs. Active devices, the blood glucose measuring devices and blood pressure measuring devices for the web portal patients were free for patients. During the project, test strips for the blood glucose measurements were free for the patients who did not need to take insulin. For patients who needed insulin, test strips were paid for by the health insurance company.

There is currently no dedicated funding for eHealth or telemonitoring activities. There is on-going work on creating targeted agreements between the Austrian and the regional governments, which might enable and facilitate eHealth implementation (i.e. the Health Reform). These targeted agreements will become common practice for all national and regional governments and for the health providers in the regions. One of the main goals of these agreements is the use of ICTs to facilitate cooperation, coordination and understanding among different bodies. The goals defined in these targeted agreements have to be achieved by 2016.

The main cost saving achieved through Renewing Health relates to the reduction of inpatient stays. The main beneficiaries of the intervention in terms of economic outcomes would therefore be the regional and federal governments, while public insurance companies, which also support inpatient care, would not see any economic improvement. This means that in order to involve the GPs, an incentive system may be needed.

Since major health care reform is pending in Austria, it is not possible to predict what a reasonable economic model would look like in the future, since this will largely depend on the actual measures taken after the reform.

3 Transferability

The case is well documented since it was deployed as part of a European project and public reports are accessible through the official project website. Moreover, in 2015 the most relevant scientific results obtained in the pilots will continue to be disseminated in relevant conferences and publications.

So far, the services have not been transferred to other regions, although the experts involved have been in contact with other regions. KABEG performed a transferability assessment during their pilot study. It was based on the positive feedback from government, insurance companies, hospital staff and some selected patients.

The Austrian Health Ministry is aware of the need to implement telemonitoring solutions for the treatment of chronic patients throughout its care system and not only in pilots or small-scale projects (e.g. Carinthia, DiabMemory in Lower Austria). In this context, they created a commission to advise on the provision of eHealth related treatment.

KABEG considered different points of view:

- Scalability: KABEG expects that results would be similar if the initiative was scaled up to country level. They base their opinion on the simple and flexible architecture of the system. Defined Disease Management Processes (DMPs) and information transmission through CDA documents facilitate scaling up. Moreover the experience of KABEG with supporting the infrastructure can be a driver for implementation in other regions.

  On the other hand, the complex funding system in Austria and the absence of a clear framework for eHealth services provision could hinder the process. In addition, all the regions in Austria are subject to similar organisational restrictions. Although this homogeneity could be a barrier, it could also facilitate scaling up. If the necessary organisational changes are produced in one region with successful results other regions could solve the same problems following the same steps.

- Generalisability: KABEG is considering the possibility of applying telemonitoring solutions for other patients, i.e. not only for those suffering from diabetes or COPD. They consider that the successful experience dealing with diabetic patients and the established infrastructure may be a catalyst for widening the selection criteria.

4 Conclusions

The Renewing Health case in Carinthia represents an integrated care service for diabetes and COPD patients. Since it was part of a European Project, KABEG received dedicated funding that has helped promote the initiative and commit the different stakeholders of the region to the deployment of these services.

The project was evaluated through a randomised control trial in terms of both patient outcomes and economic impact. Regarding the clinical outcome, no major differences were found between the group which received the interventions and the control groups. Regarding the economic impact, results suggest that savings can be derived from the use

of the service, although due to differences in the characteristics of the intervention and control groups, the results were not conclusive.

With regard to the use of ICT by the patients, some differences were apparent. Diabetic patients used the system without problems and reported a good experience. In contrast, COPD patients (with worse health status) were not able to use the remote monitoring system, so monitoring tasks were delegated to the dedicated nurse. In order to provide COPD with special support, a dedicated call centre was set up, supported by A1 Telekom Austria.

From a technical standpoint, one of the main objectives of the Carinthian branch of the Renewing Health project was to establish and extend a robust infrastructure and an integrated treatment process using electronic systems. Before the project started, KABEG counted on a set of technology-based services, such as: (1) the collection of common data on nursing with mobile devices during home care, (2) clinical records for the outpatient area, and (3) HIS support for physicians and nurses. During the course of the project, personal health systems were integrated into the architecture in order to support the remote collection of medical data. However, the lack of conclusive results obtained during the project trials compromise the deployment of such a telemonitoring system and its use in general practice. Organisational issues and costs – i.e. not all Active Devices are supported by public insurance companies – need to be further explored in order to finally bring the telemonitoring service into standard practice, and to keep it up and running.

The smooth cooperation between the institutions involved at different levels represented a good basis for integration of care delivery. Some barriers still need to be solved, such as the definition of standards for communication amongst professionals.

To sum up, Figure 7 shows the main facilitators (Villalba, 2013) that characterise the KABEG case, interoperable information systems and policy commitment being the main ones. These two drivers are followed by governance mechanisms already set in place to foster integrated care, taking into account the focus on patients and national investments and funding programmes at a hospital and regional level. Lastly, incentives and financing, and engaged professionals play a minor role in this case, but they could hamper the full deployment of the initiative at a regional level.

Figure 7- Facilitators of Renewing Health in Carinthia

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Annex

This annex includes the main tables for the impact extracted from reports provided by KABEG.

Table 5 - Primary Clinical Outcomes of Diabetic Patients[11]

Outcome Measure	Intervention		Control		Mean difference after 12 month between groups (95% CI)	P value
	Baseline (t1)	After 12 months (t2)	Baseline (t1)	After 12 months (t2)		
	Median (SD) Median					
HbA1c	8.7 (1.9) 8.1	7.5 (1.5) 7.2	8.1 (1.2) 8.0	7.5 (1.1) 7.5	-.6[a] (-1.3 to 0.05)	.025
SF-36: Physical Functioning 0-100 Score	72.5 (25.2) 80	77.1 (22.3) 85	69.2 (25.8) 75	74.9 (24.1) 85	-1.1b (-7.9 to 5.9)	.884
SF-36: Role Physical 0-100 Score	63.8 (24.3) 62.5	72.5 (25.1) 75.0	58.5 (29.5) 56.3	68.3 (29.3) 75.0	-1.1 (-10.3 to 8.1)	.986
SF-36: Bodily Pain 0-100 Score	62.2 (31.0) 62.0	66.5 (30.0) 64.0	59.8 (33.6) 62.0	66.7 (30.9) 72.0	-2.7 (-13.0 to 7.7)	.793
SF-36: General Health 0-100 Score	62.2 (16.6) 62.0	69.4 (18.8) 72.0	62.6 (19.3) 64.5	67.9 (17.9) 67.0	1.9 (-3.9 to 7.7)	.154
SF-36: Vitality 0-100 Score	58.4 (19.3) 62.5	63.2 (19.1) 68.8	56.3 (25.7) 53.1	61.6 (23.6) 62.5	-0.5 (-7.0 to 5.9)	.869
SF-36: Social Functioning 0-100 Score	81.3 (22.1) 87.5	81.3 (26.6) 100.0	80.1 (23.1) 87.5	86.7 (18.8) 100.0	-6.6 (-14.4 to 1.3)	.120
SF-36: Role Emotional 0-100 Score	70.7 (24.5) 75.0	78.7 (25.3) 91.7	67.5 (28.2) 75.0	77.7 (28.4) 100.0	-2.2 (-12.2 to 7.7)	.965
SF-36: Mental Health 0-100 Score	72.1 (18.8) 80.0	72.6 (20.1) 80.0	72.2 (21.7) 75.0	76.1 (19.6) 80.0	-3.5 (-9.3 to 2.3)	.254
SF-36: PCS Physical Component Score	45.1 (9.9) 46.1	47.9 (9.5) 49.4	43.7 (10.4) 44.9	46.3 (9.6) 48.0	.13 (-2.8 to 3.1)	.445

Notes:
- Data are mean scores (SD) and medians; differences between groups after 12 month were compared by using Mann-Whitney-U-tests.
- a: a negative value indicates a higher improvement for intervention group.
- b: a negative value in SF-36-differences indicates a higher improvement for control group.

[11] Internal report provided by KABEG: Deliverable D15.7-1 Final Pilot Evaluation – Carinthia Cluster 1 Version 1.0 by Renewing Health and KABEG

Table 6 - Secondary Clinical Outcomes of Diabetic Patients[11]

Outcome Measure	Intervention		Control		Mean difference after 12 month between groups (95% CI)	P value
	Baseline (t1)	After 12 months (t2)	Baseline (t1)	After 12 months (t2)		
	Median(SD)					
	Median					
Cholesterol	197.6 (53.1) 188.0	186.1 (51.3) 173.0	186.8 (37.8) 188.0	185.2 (41.6) 176.0	9.9[c] (-3.0 to 22.9)	.821
LDL-cholesterol	112.1 (42.5) 99.0	107.6 (44.2) 92.5	107.5 (36.3) 106.0	104.3 (38.7) 92.5	1.3 (-10.7 to 13.2	.166
HDL-cholesterol	47.1 (12.6) 45.5	48.1 (16.9) 45.0	48.2 (16.8) 47.0	51.3 (17.6) 47.5	-2.1 (-6.3 to 2.2	.773
Weight	90.74 (20.0) 88.0	90.3 (19.3) 90.0	90.2 (19.0) 93.0	89.9 (19.0) 91.0	0.4 (-1.5 to 2.3)	.155
BMI	31.2 (5.3) 30.9	31.2 (5.3) 30.9	31.3 (6.0) 31.1	31.3 (6.0) 31.1	0.05 (-0.6 to 0.7)	.972
Blood Pressure: Diastolic	88.9 (12.6) 88.0	84.8 (12.6) 85.0	86.7 (12.9) 88.0	85.2 (13.0) 86.0	2.5 (-2.3 to 7.4)	.182
Blood Pressure: Systolic	153.7 (23.1) 149.0	148.7 (23.6) 145.0	150.4 (21.3) 149.0	149.3 (21.1) 148.0	3.9 (-4.6 to 12.3)	.220
Triglyceride	233.5 (260.7) 165.5	181.4 (125.2) 152.5	155.1 (78.0) 141.0	157.0 (90.7) 139.0	54.0 (-15.0 to 123.0)	.057

Notes:

- Data are mean scores (SD) and medians, differences between groups after 12 month were compared by using Mann-Whitney-U-tests.
- A positive value in SGRQ-differences indicates a higher improvement for intervention group.

Table 7 - SUTAQ Results Diabetic Patients[11]

Outcome Measure	Intervention after 3 months	Intervention after 12 months	Mean difference after 12 month between t1 and t2 (95% CI)	P value
	Median (SD) Median			
F1: enhanced care	5.2 (0.9) 5.6	5.4 (1.0) 5.8	-0.11[a] (-0.3 to 0.9)	.058
F2: increased accessibility	4.9 (1.1) 5.3	5.2 (1.2) 5.8	-0.25[a] (-0.6 to 0.05)	.015
F3: privacy & discomfort scale	2.4 (1.2) 2.3	2.1 (1.0) 2.0	0.38[b] (-0.0 to 0.8)	.065
F4: care personnel concerns	2.6 (1.5) 2.7	1.9 (1.2) 1.3	0.64[b] (0.20 to 1.1)	.007
F5: kit as substitution	3.6 (1.3) 4.0	3.5 (1.2) 3.7	0.13[a] (-0.3 to 0.6)	.590
F6: satisfaction	5.7 (0.6) 6.0	5.6 (0.8) 6.0	0.01[a] (-0.2 to 0.2)	.734

Notes:
- Data are mean scores (SD) and medians; differences between groups after 12 month were compared by using Mann-Whitney-U test.

Table 8 - Primary Clinical Outcomes of COPD Patients[12]

Outcome Measure	Intervention		Control		Mean difference after 12 month between groups (95% CI)	P value
	Baseline (t1)	After 12 months (t2)	Baseline (t1)	After 12 months (t2)		
	Median (SD) Median					
SF36-Physical Functioning	48.2 (24.5) 45.0	39.8 (31.5) 40.0	35.0 (27.4) 20.0	22.8 (15.4) 30.0	3.8 (-9.4 to 16.9)	.616
Role Physical	40.7 (20.0) 43.8	35.9 (25.0) 31.3	19.5 (19.2) 25.0	28.9 (20.9) 28.1	-14.2 (-31.1 to 2.7)	.156
SF36-Bodily Pain	55.6 (28.8) 52.0	55.3 (32.6) 51.0	59.1 (40.2) 72.0	52.8 (39.1) 41.5	6.1 (-17.2 to 29.3)	.340
SF36-General Health	49.3 (14.4) 45.0	47.3 (25.1) 45.0	40.1 (26.7) 40.0	36.3 (21.3) 33.5	1.9 (-14.2 to 18.0)	.617
SF36-Vitality	44.0 (16.4) 43.8	44.6 (27.9) 40.6	38.3 (25.1) 37.5	35.5 (22.4) 31.3	3.4 (-14.1 to 20.9)	.769
SF36-Social Functioning	67.4 (24.4) 75.0	61.2 (33.9) 62.5	58.6 (36.7) 87.5	64.1 (36.8) 75.0	-11.7 (-33.0 to 9.6)	.263
SF36-Role Emotional	53.4 (28.8) 50.0	53.7 (33.6) 45.8	27.6 (28.7) 25.0	45.8 (29.0) 45.8	-17.9 (-43.3 to 7.4)	.118
SF36-Mental Health	59.5 (19.9) 60.0	59.6 (26.7) 60.0	53.1 (26.6) 60.0	56.6 (27.8) 62.5	-3.3 (-17.7 to 11.2)	1.00
SF36-PCS Physical Component Score	38.1 (7.6) 37.6	36.1 (10.3) 35.2	35.3 (11.3) 34.1	31.0 (9.2) 31.0	2.3 (-3.3 to 7.8)	.412
SF36-MCS Mental Component Score	41.8 (11.7) 40.6	42.7 (14.8) 41.0	35.0 (13.1) 36.4	41.0 (14.6) 42.9	-5.1 (-14.6 to 4.5)	.292

Notes:

- Data are mean scores (SD) and medians, differences between groups after 12 month were compared by using Mann-Whitney-U-tests All scores are 1 - 100
- A negative value in SF-36-differences indicates a higher improvement for control group

[12] Internal deliverable provided by KABEG: Deliverable D15.7-5 Final Pilot Evaluation – Carinthia Cluster 5 Version 0.4 by Renewing Health and KABEG

Table 9 - Primary Clinical Outcomes of COPD Patients[12]

Saint George's Questionnaire Outcome Measure	Intervention		Control		Mean difference after 12 month between groups (95% CI)	P value
	Baseline (t1)	After 12 months (t2)	Baseline (t1)	After 12 months (t2)		
	Median (SD) Median					
Symptoms score	69.0 (18.0) 72.7	61.2 (27.6) 66.0	74.0 (20.1) 70.8	67.4 (24.2) 73.3	1.3 (-19.0 to 21.5)	.721
Activity score	68.9 (22.9) 75.8	62.4 (28.4) 69.4	76.3 (17.2) 77.8	79.3 (13.5) 79.1	9.5 (-3.5 to 22.6)	.315
Impacts score	42.6 (20.9) 42.8	42.3 (23.3) 47.2	55.1 (17.9) 57.2	54.3 (20.1) 55.6	-0.5 (-14.4 to 13.4)	.989
Total score	54.6 (18.1) 56.4	50.8 (24.0) 57.7	64.8 (15.3) 65.4	64.2 (17.7) 64.6	3.2 (-9.8 to 16.3)	.849

Notes:

- Data are mean scores (SD) and medians, differences between groups after 12 month were compared by using Mann-Whitney-U-tests.
- A positive value in SGRQ-differences indicates a higher improvement for intervention group.

Table 10 - SUTAQ Results COPD patients[12]

Outcome Measure	Intervention after 3 months	Intervention after 12 months	Mean difference after 12 month between t1 and t2 (95% CI)	P value
	Median (SD) Median			
F1: enhanced care	5.3 (0.8) 5.6	4.7 (1.1) 4.8	0.58[a] (-0.0 to 1.2)	.036
F2: increased accessibility	4.8 (1.1) 4.9	4.4 (1.5) 4.9	0.32[a] (-0.6 to 1.2)	.432
F3: privacy & discomfort scale	2.5 (1.4) 2.3	2.5 (1.5) 2.3	0.08[b] (-1.0 to 1.2)	.656
F4: care personnel concerns	2.6 (1.8) 1.3	2.2 (1.4) 2.0	0.46[b] (-1.0 to 1.9)	.568
F5: kit as substitution	3.4 (1.3) 3.3	2.8 (1.3) 2.7	0.58[a] (-0.1 to 1.3)	.098
F6: satisfaction	5.6 (0.6) 6.0	5.5 (0.6) 6.0	0.06[a] (-0.2 to 0.3)	.673

Notes:

- Data are mean scores (SD) and medians; differences between t1 (after 3 months) and t2 (after 12 months) were compared by using Wilcoxon tests.

- a: a negative value in SUTAQ differences indicates a higher agreement with the aspects of the kit at t2.
- b: a positive value in SUTAQ differences indicates a higher agreement with the aspects of the kit at t2

Table 11 - Types of resources included in the estimation of costs

Type of Costs		Method of Data Collection	Estimation at patient or group level
Investment in the telemedicine application			
	Education of Staff	Questionnaire to staff	Group level
Running Costs			
Intramural Area	time used by staff - education of patients	interview with staff, documentation	Patient level
	time used by staff - medical treatments		
	number of telemedicine visitations	HIS-System	
Transmission	standard rate special devices	documentation	
	standard rate internet portal		
Travelling expenses	km home-hospital	Patients data	
	km home-doctor		
Persons time	time used by patient	Questionnaire, patient	
	Time used by relatives		
Effects on patient use of health care			
Intramural Area	Number of outpatient visits	HIS-System	Patient level
	Number of inpatient days		
	Inpatient days per stay		
Extramural Area	Number of contacts with GP	Questionnaire patients	
	Number of contacts with consultant		
	Number of contacts with emergency doctor		
	Number of stays in other hospitals (not KABEG)		

Table 12 - Analysis of cost differences[11]

Case	Number of Patients	Total cost intervention group (per patient)	Total cost control group (per patient)	Mean difference
DIABETES				
Base Case	193	2,006€	2,121€	-115€
Men	110	2,022€	2,157€	-135€
Women	83	1,988€	2,067€	-79€
Patients aged >70	37	1,548€	1,571€	-23€
Patients aged<71	156	2,103€	2,283€	-180€
COPD				
Base Case	65	6056.73€	2,121€	-1617.90€
Men	44	5580.53 €	2,157€	-112.38€
Women	21	7186.59€	2,067€	-2249.20€
Patients aged >70	19	5651.76€	1,571€	-3966.14€
Patients aged<71	156	2,103€	2,283€	-3374.68€

Table 13 – Cost of different services for different groups (Rounded values) [11]

	Cost of outpatient visits	Cost of inpatient stays	Costs of GP	Cost of Medical specialists
DIABETES				
Base case				
Intervention	122	1245	71	43
Control	114	1794	65	59
Men				
Intervention	94	1291	75	43
Control	129	1808	64	68
Women				
Intervention	141	1188	66	43
Control	94	1773	67	45
Aged>70				
Intervention	70	767	95	42
Control	78	1178	105	123
Aged<71				
Intervention	124	1344	67	43
Control	125	1971	55	43
COPD				
Base case				
Intervention	122	5143	88	192
Control	36	7180	120	138
Men				
Intervention	93	4700	99	176
Control	11	6237	104	140
Women				
Intervention	191	6188	51	245
Control	80	8877	142	136
Aged>70				
Intervention	67	9687	82	278
Control	38	6170	130	121
Aged<71				
Intervention	127	4742	89	182
Control	33	8526	109	158

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